Appendix K
Gulf Sturgeon Telemetry Survey Presentation

Summary of Gulf Sturgeon monitoring activities on Ship Island: 2012-2013 deployment period.

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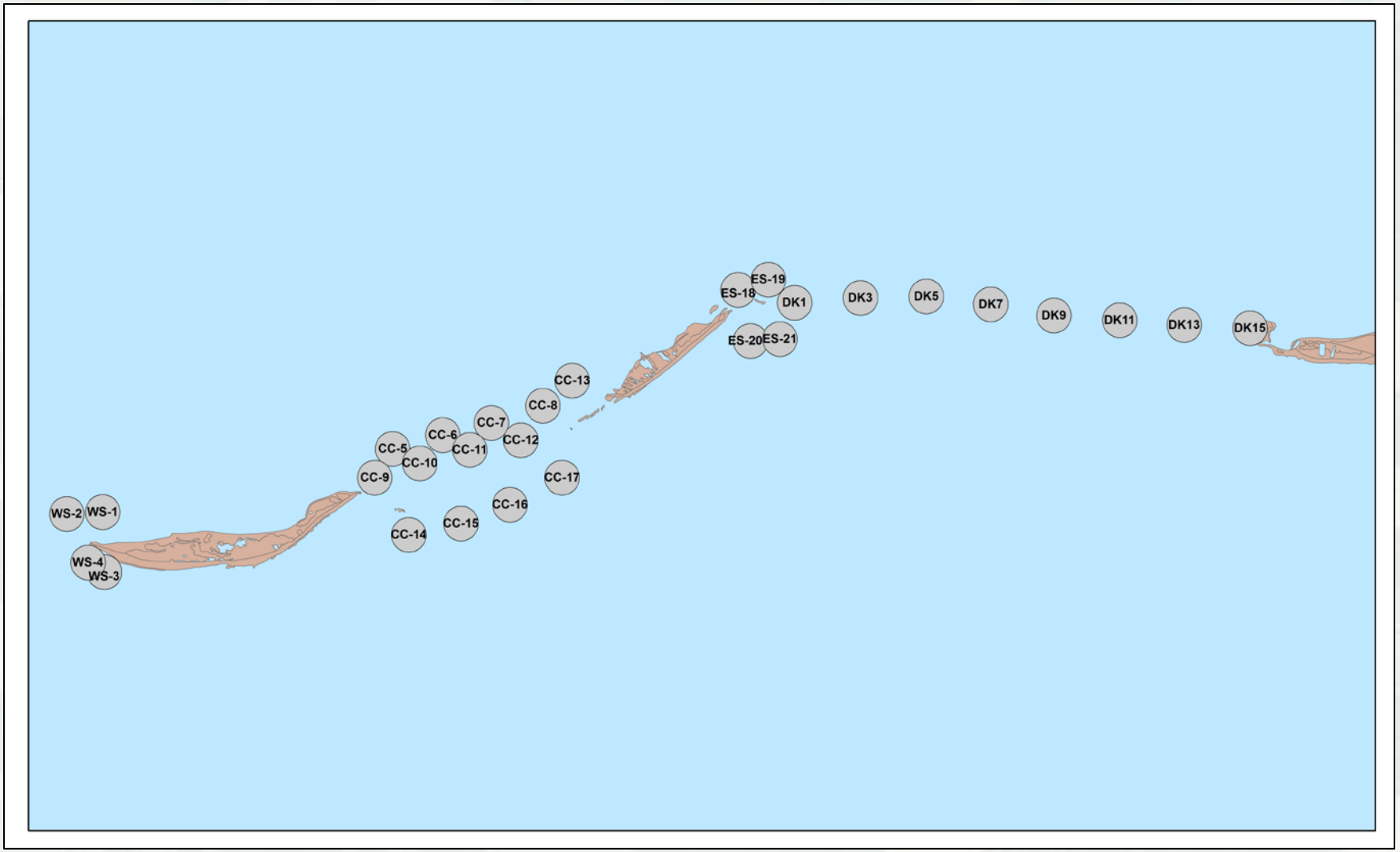
Objectives

- Assess habitat utilization of Gulf sturgeon along Ship Island and at Camille Cut (i.e., project zone) by monitoring acoustically tagged individuals before (baseline), during (construction phase) and after the filling of the Cut (post-fill).
- Approach evaluated at two different levels:
  - Coarse scale assessment to determine the relative occurrence of Gulf sturgeon within the project area.
  - Fine scale assessment to address more specifically what Gulf sturgeon are doing within identified areas.

- YEAR 1: 14 April 2011 – 9 May 2011 (21 telemetry receivers); no detections.
- YEAR 2: 20 September 2011 – 30 June 2012 (21 receivers); 13,720 detections, 14 Gulf sturgeon.

Station name and GPS coordinates for 29 telemetry receivers deployed during Year 3 of the MsCIP Ship Island Gulf sturgeon monitoring project.

13 September 2012 -11 June 2013			
Station Name	Abbreviated Name	Latitude (dd.dd)	Longitude (dd.dd)
West Ship 1	WS-1	30.21618	-88.98468
West Ship 2	WS-2	30.21589	-88.99113
West Ship 3	WS-3	30.20687	-88.98438
West Ship 4	WS-4	30.20835	-88.98730
Camille Cut 5	CC-5	30.22600	-88.93257
Camille Cut 6	CC-6	30.22813	-88.92355
Camille Cut 7	CC-7	30.23002	-88.91482
Camille Cut 8	CC-8	30.23270	-88.90555
Camille Cut 9	CC-9	30.22152	-88.93578
Camille Cut 10	CC-10	30.22374	-88.92768
Camille Cut 11	CC-11	30.22585	-88.91869
Camille Cut 12	CC-12	30.22733	-88.90952
Camille Cut 13	CC-13	30.23659	-88.90028
Camille Cut 14	CC-14	30.21264	-88.92966
Camille Cut 15	CC-15	30.21440	-88.92028
Camille Cut 16	CC-16	30.21732	-88.91147
Camille Cut 17	CC-17	30.22152	-88.90212
East Ship 18	ES-18	30.25067	-88.87045
East Ship 19	ES-19	30.25227	-88.86501
East Ship 20	ES-20	30.24274	-88.86823
East Ship 21	ES-21	30.24304	-88.86294
Dog Keys Pass 1	DK1	30.24868	-88.86030
Dog Keys Pass 3	DK3	30.24942	-88.84846
Dog Keys Pass 5	DK5	30.24966	-88.83663
Dog Keys Pass 7	DK7	30.24843	-88.82504
Dog Keys Pass 9	DK9	30.24670	-88.81370
Dog Keys Pass 11	DK11	30.24597	-88.80186
Dog Keys Pass 13	DK13	30.24523	-88.79027
Dog Keys Pass 15	DK15	30.24473	-88.77844



300 m detection radius from anchored buoy.

- YEAR 3 Deployment period: 13 September 2012 - 11 June 2013.

- Downloaded at 3-4 week intervals.

- 94,244 total detections logged (not corrected for simultaneous detections).

- 21 Gulf sturgeon documented on the array.
    - Pearl River (n=6)
    - Pascagoula River (n=4)
    - Escambia River (n=1)
    - Blackwater River (n=3)
    - Yellow River (n=2)
    - Choctawhatchee River (n=1)
    - Brothers River (n=4).

	2011-2012 array	2012-2013 array
Total detections	13,720	94,244
Total detected Gulf sturgeon	14	21
River of Origin		
Pearl River	4	6
Pascagoula River	4	4
Escambia River	1	1
Blackwater River	4	3
Yellow River	1	2
Choctawhatchee River	0	1
Brothers River	0	4

- The number of total detections outnumbered those recorded for a similar deployment period during the previous year although part of this increase could be attributed to the additional 8 receivers deployed in Dog Keys Pass in Year 3 (**21 vs. 29 receivers**) .

- The number of detected Gulf sturgeon was greater during the 2012-2013 deployment period but the distribution of detected individuals by river of origin was similar between deployment periods , except for the inclusion of individuals from drainages representing the eastern portion of the species range (i.e., Choctawhatchee and Brothers rivers).

Summary data for the 21 Gulf sturgeon detected on the 2012-2013 telemetry array.
Size class delineation: A = Adult, SA = Sub-adult.

River of Origin	Transmitter	Date tagged	Size Class	FL (cm)	Weight (kg)
Pearl	A69-1303-45717	9/28/2010	A	162.5	47.7
Pearl	A69-1303-45767	10/15/2010	A	148	24.2
Pearl	A69-1303-45720	10/13/2010	A	170	43.6
Pearl	A69-1303-45746	9/28/2010	A	132	29.9
Pearl	A69-1303-45765	9/28/2010	SA	121	26.4
Pearl	A69-1303-45721	10/13/2010	A	148	16.5
Pascagoula	A69-1303-46208	10/24/2011	A	138	19.5
Pascagoula	A69-1303-45053	9/20/2011	SA	104	14.45
Pascagoula	A69-1303-46215	10/7/2010	A	147	23.6
Pascagoula	A69-9001-29899	10/31/2012	A	131.6	17.6
Escambia	A69-1303-61008	9/30/2009	A	177.8	53.6
Yellow	A69-9001-30554	10/7/2011	A	173	48.35
Yellow	A69-9001-30564	10/4/2011	A	195	54.7
Brothers	A69-1303-46423	9/10/2010	A	188	56
Brothers	A69-1303-45716	10/7/2010	A	147	22.4
Brothers	A69-1303-46434	9/2/2010	A	163	33.1
Brothers	A69-9001-30534	10/5/2011	A	129	16.9
Blackwater	A69-1303-61040	9/21/2009	A	163	38.7
Blackwater	A69-1303-61034	9/22/2009	A	186.7	57.8
Blackwater	A69-1303-61041	10/2/2009	A	146	23.8
Choctawhatchee	A69-1303-45862	10/9/2010	A	186	54

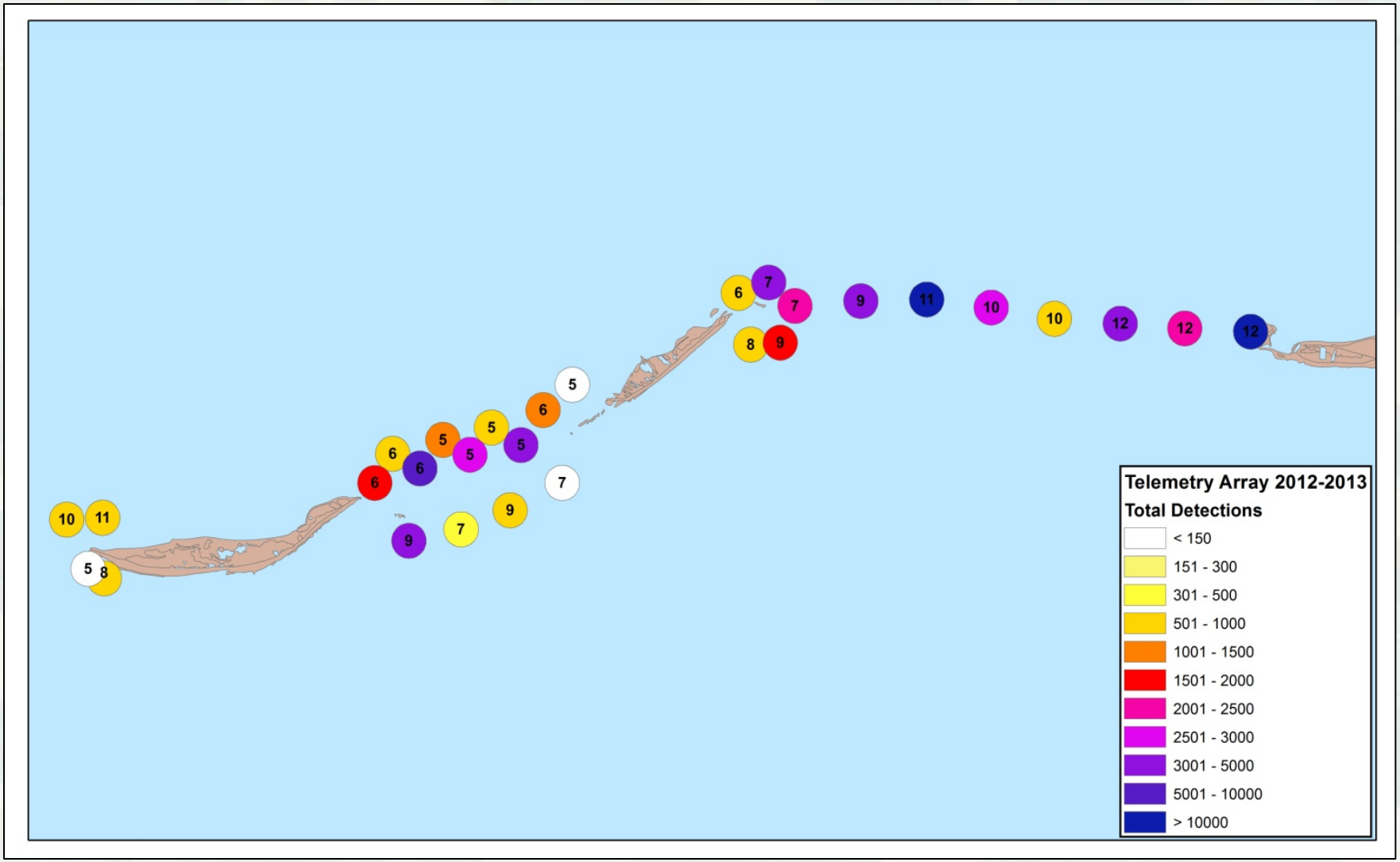
- 19 adult fish ranging 129-195 cm FL (mean: 159.6)
- 2 sub-adults ranging 104-121 cm FL (mean: 112.5)

Detection summary
13 September 2012 – 11 June 2013

River of Origin	Transmitter	West Pass				Camille Cut													East Pass				Dog Keys Pass								Total Det	Number of stations Sturgeon present at
		WS1	WS2	WS3	WS4	CC5	CC6	CC7	CC8	CC9	CC10	CC11	CC12	CC13	CC14	CC15	CC16	CC17	ES18	ES19	ES20	ES21	DK1	DK3	DK5	DK7	DK9	DK11	DK13	DK15		
Pearl	A69-1303-45717	187	372	22	79	14	26	18	12	305	139	65	60	9	0	0	1	10	0	0	12	16	0	0	0	0	0	0	0	0	1347	17
Pearl	A69-1303-45767	0	0	0	0	0	0	0	113	0	0	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	206	2
Pearl	A69-1303-45720	29	34	0	6	9	13	0	0	29	23	25	0	0	12	5	3	0	51	165	17	21	23	78	20287	276	18	33	35	8	21200	23
Pearl	A69-1303-45746	165	174	347	28	170	556	245	74	752	2674	1636	750	31	1602	109	13	0	3	3	15	1	2	6	26	4	0	5	0	0	9391	25
Pearl	A69-1303-45765	1	6	7	0	0	0	0	0	0	0	0	0	0	8	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	24	6
Pearl	A69-1303-45721	11	6	25	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55	4
Pascagoula	A69-1303-46208	3	0	0	0	4	0	0	0	40	17	0	0	0	38	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	106	6
Pascagoula	A69-1303-45053	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	89	444	0	0	0	2	288	3	32	34	17	0	909	8
Pascagoula	A69-1303-46215	12	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	10	81	4
Pascagoula	A69-9001-29899	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	272	0	9	0	5	2891	51	21	26	56	8	3364	10
Escambia	A69-1303-61008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	4	0	0	32	30	5	18	88	0	0	0	0	8	200	8
Yellow	A69-9001-30554	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	764	3675	598	1496	2137	4148	1469	1478	185	389	214	50	16603	12
Yellow	A69-9001-30564	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33	313	71	224	35	1010	1686	6
Brothers	A69-1303-46423	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	138	394	2394	349	3343	6622	6
Brothers	A69-1303-45716	73	109	81	0	0	0	8	22	0	0	0	18	0	18	4	20	0	0	0	0	0	0	0	0	0	0	0	0	0	353	9
Brothers	A69-1303-46434	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	561	71	2	635	4
Brothers	A69-9001-30534	12	4	11	0	0	0	0	0	0	0	0	0	0	5	3	26	27	0	353	11	18	24	18	6993	68	2	144	76	10	7805	18
Blackwater	A69-1303-61040	48	68	349	0	228	469	310	806	408	1742	875	2541	3	1959	195	343	73	0	0	49	9	69	19	575	583	19	303	448	186	12677	26
Blackwater	A69-1303-61034	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	701	701	1
Blackwater	A69-1303-61041	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0	0	5	0	0	0	0	0	0	0	0	0	31	761	6812	7633	5
Choctawhatchee	A69-1303-45862	6	6	9	4	118	93	59	8	268	688	214	47	6	437	102	184	2	6	58	1	7	2	1	1	82	3	173	61	0	2646	28
	Total Det @ Stat	547	817	851	130	543	1157	640	1035	1802	5283	2815	3416	142	4103	422	606	122	938	4970	735	1607	2262	4295	32655	2996	746	4317	2144	12148		
	Total GS @ Stat	11	10	8	5	6	5	5	6	6	6	5	5	5	9	7	9	7	6	7	8	9	7	9	11	10	10	12	12	12		

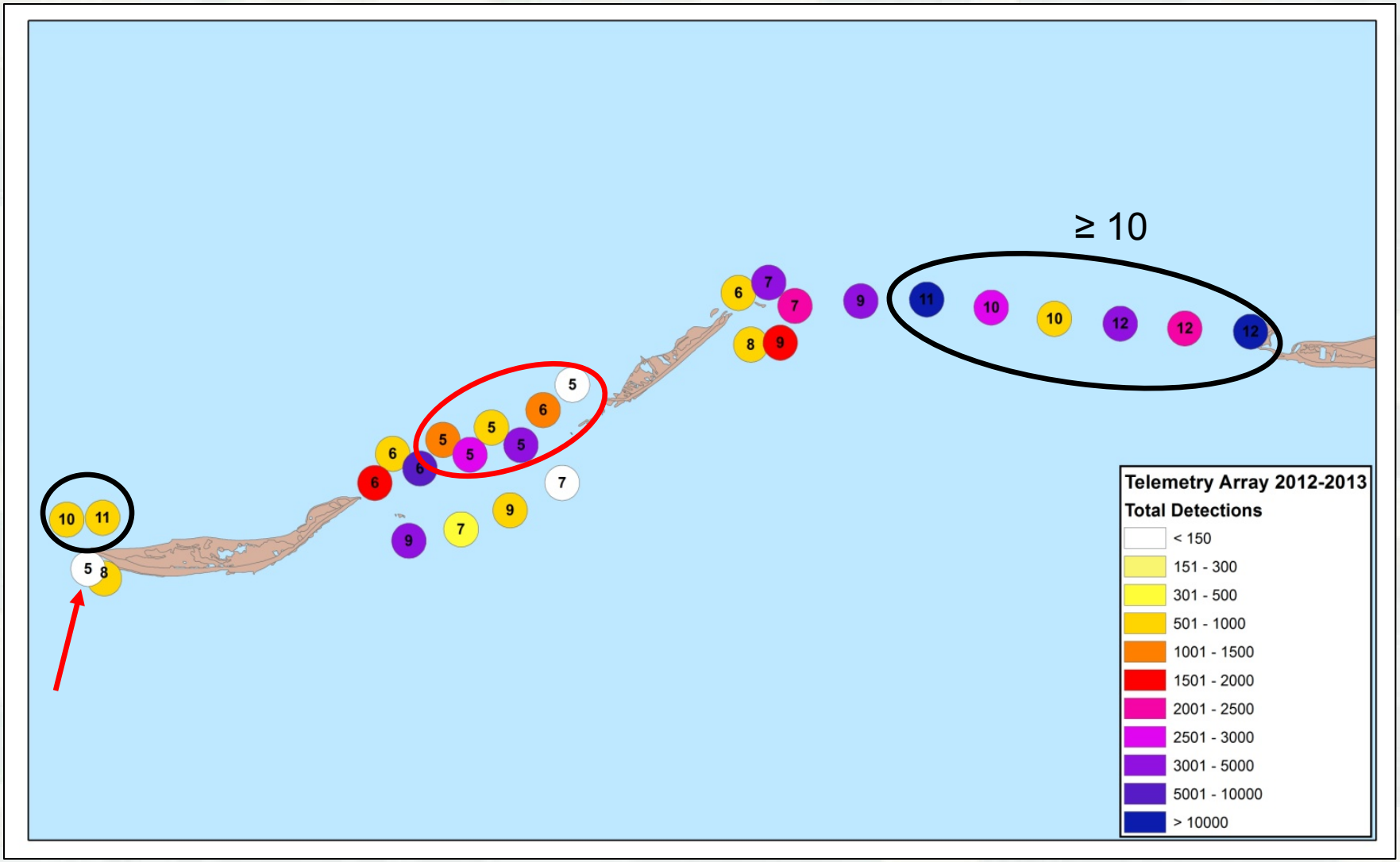
Detection summary
13 September 2012 – 11 June 2013

River of Origin	Transmitter	West Pass				Camille Cut													East Pass				Dog Keys Pass								Total Det	Number of stations Sturgeon present at
		WS1	WS2	WS3	WS4	CC5	CC6	CC7	CC8	CC9	CC10	CC11	CC12	CC13	CC14	CC15	CC16	CC17	ES18	ES19	ES20	ES21	DK1	DK3	DK5	DK7	DK9	DK11	DK13	DK15		
Pearl	A69-1303-45717	187	372	22	79	14	26	18	12	305	139	65	60	9	0	0	1	10	0	0	12	16	0	0	0	0	0	0	0	0	1347	17
Pearl	A69-1303-45767	0	0	0	0	0	0	0	113	0	0	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	206	2
Pearl	A69-1303-45720	29	34	0	6	9	13	0	0	29	23	25	0	0	12	5	3	0	51	165	17	21	23	78	20287	276	18	33	35	8	21200	23
Pearl	A69-1303-45746	165	174	347	28	170	556	245	74	752	2674	1636	750	31	1602	109	13	0	3	3	15	1	2	6	26	4	0	5	0	0	9391	25
Pearl	A69-1303-45765	1	6	7	0	0	0	0	0	0	0	0	0	0	8	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	24	6
Pearl	A69-1303-45721	11	6	25	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55	4
Pascagoula	A69-1303-46208	3	0	0	0	4	0	0	0	40	17	0	0	0	38	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	106	6
Pascagoula	A69-1303-45053	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	89	444	0	0	0	2	288	3	32	34	17	0	909	8
Pascagoula	A69-1303-46215	12	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	10	81	4
Pascagoula	A69-9001-29899	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	272	0	9	0	5	2891	51	21	26	56	8	3364	10
Escambia	A69-1303-61008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	4	0	0	32	30	5	18	88	0	0	0	0	8	200	8
Yellow	A69-9001-30554	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	764	3675	598	1496	2137	4148	1469	1478	185	389	214	50	16603	12
Yellow	A69-9001-30564	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33	313	71	224	35	1010	1686	6
Brothers	A69-1303-46423	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	138	394	2394	349	3343	6622	6
Brothers	A69-1303-45716	73	109	81	0	0	0	8	22	0	0	0	18	0	18	4	20	0	0	0	0	0	0	0	0	0	0	0	0	0	353	9
Brothers	A69-1303-46434	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	561	71	2	635	4
Brothers	A69-9001-30534	12	4	11	0	0	0	0	0	0	0	0	0	0	5	3	26	27	0	353	11	18	24	18	6993	68	2	144	76	10	7805	18
Blackwater	A69-1303-61040	48	68	349	0	228	469	310	806	408	1742	875	2541	3	1959	195	343	73	0	0	49	9	69	19	575	583	19	303	448	186	12677	26
Blackwater	A69-1303-61034	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	701	701	1
Blackwater	A69-1303-61041	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0	0	5	0	0	0	0	0	0	0	0	0	31	761	6812	7633	5
Choctawhatchee	A69-1303-45862	6	6	9	4	118	93	59	8	268	688	214	47	6	437	102	184	2	6	58	1	7	2	1	1	82	3	173	61	0	2646	28
	Total Det @ Stat	547	817	851	130	543	1157	640	1035	1802	5283	2815	3416	142	4103	422	606	122	938	4970	735	1607	2262	4295	32655	2996	746	4317	2144	12148		
	Total GS @ Stat	11	10	8	5	6	5	5	6	6	6	5	5	5	9	7	9	7	6	7	8	9	7	9	11	10	10	12	12	12		



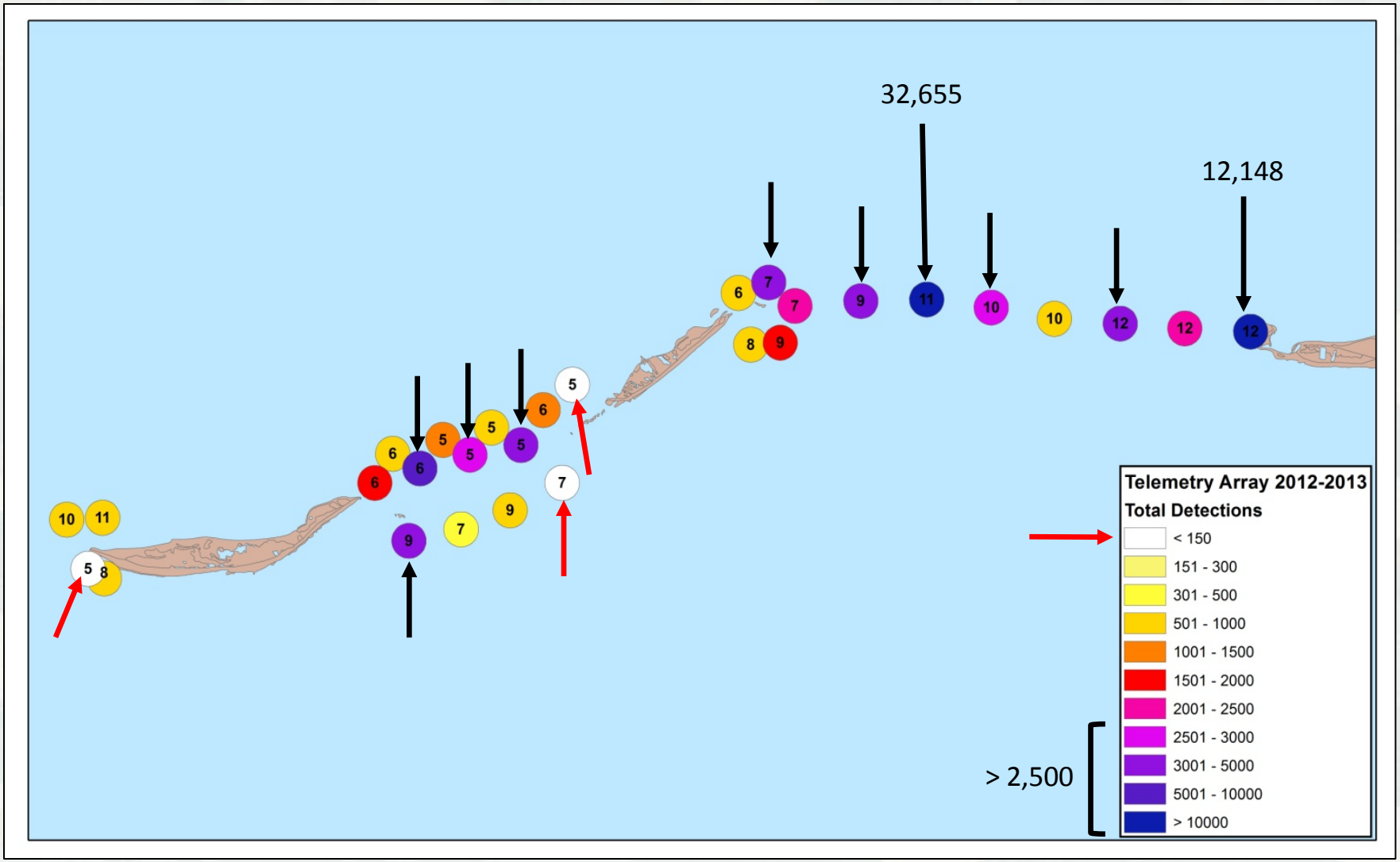
Distribution of total detections across all VR2Ws in the MsCIP array. The number within the plotted receiver represents the total number of Gulf sturgeon documented on that specific receiver during the deployment period. Color of receiver buffer depicts the relative number of detections recorded during the deployment period.

Number of detected sturgeon

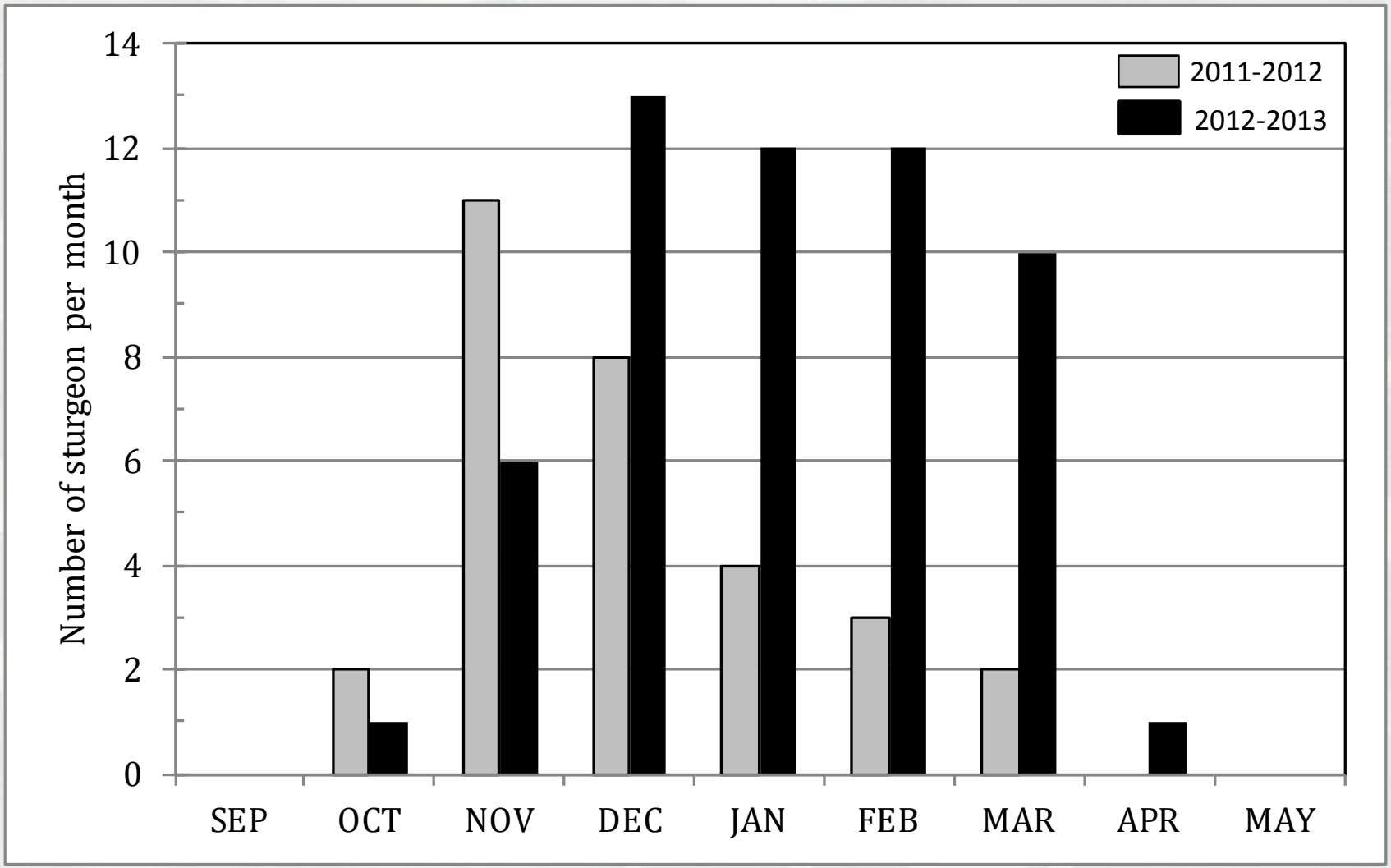


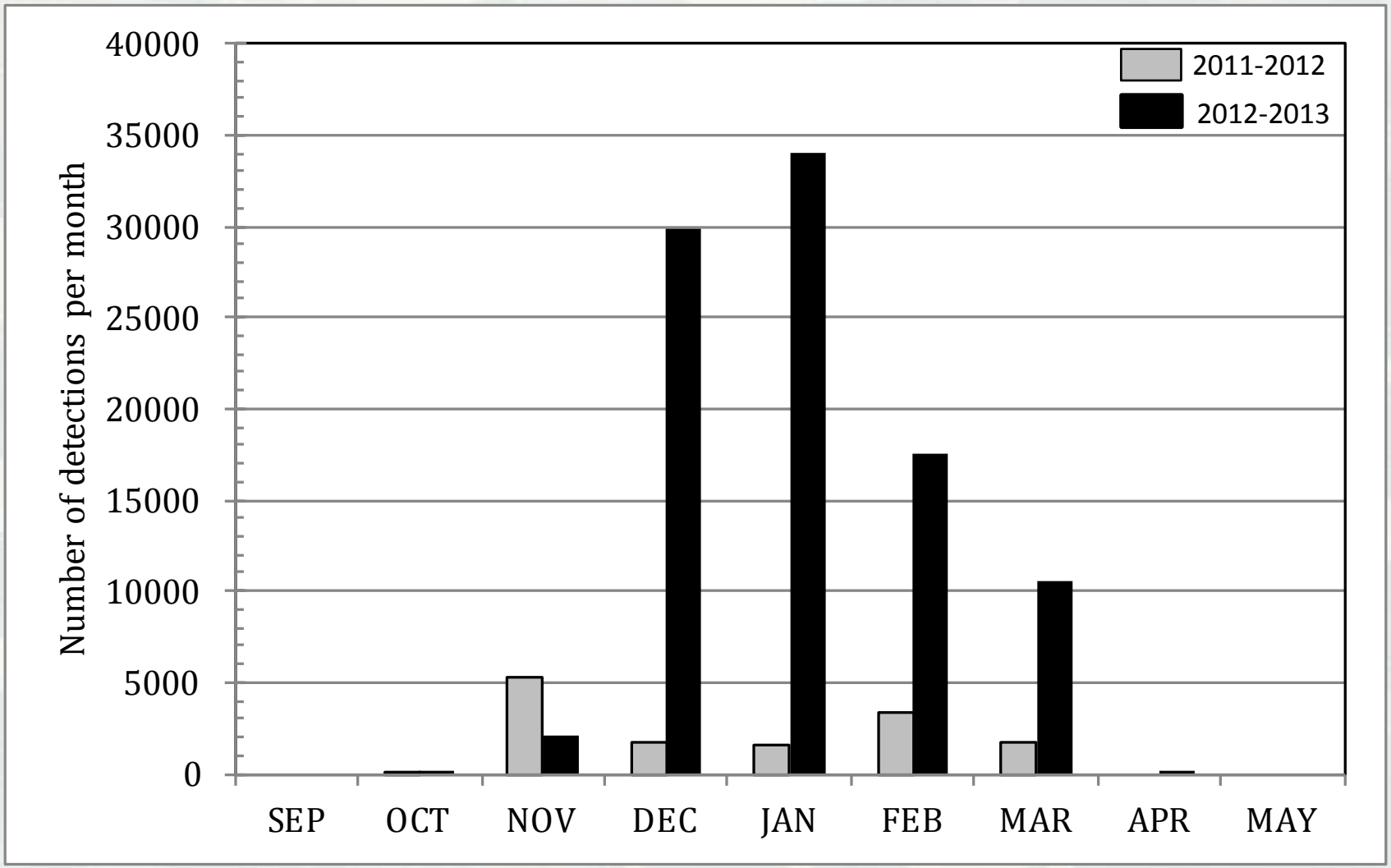
Distribution of total detections across all VR2Ws in the MsCIP array. The number within the plotted receiver represents the total number of Gulf sturgeon documented on that specific receiver during the deployment period. Color of receiver buffer depicts the relative number of detections recorded during the deployment period.

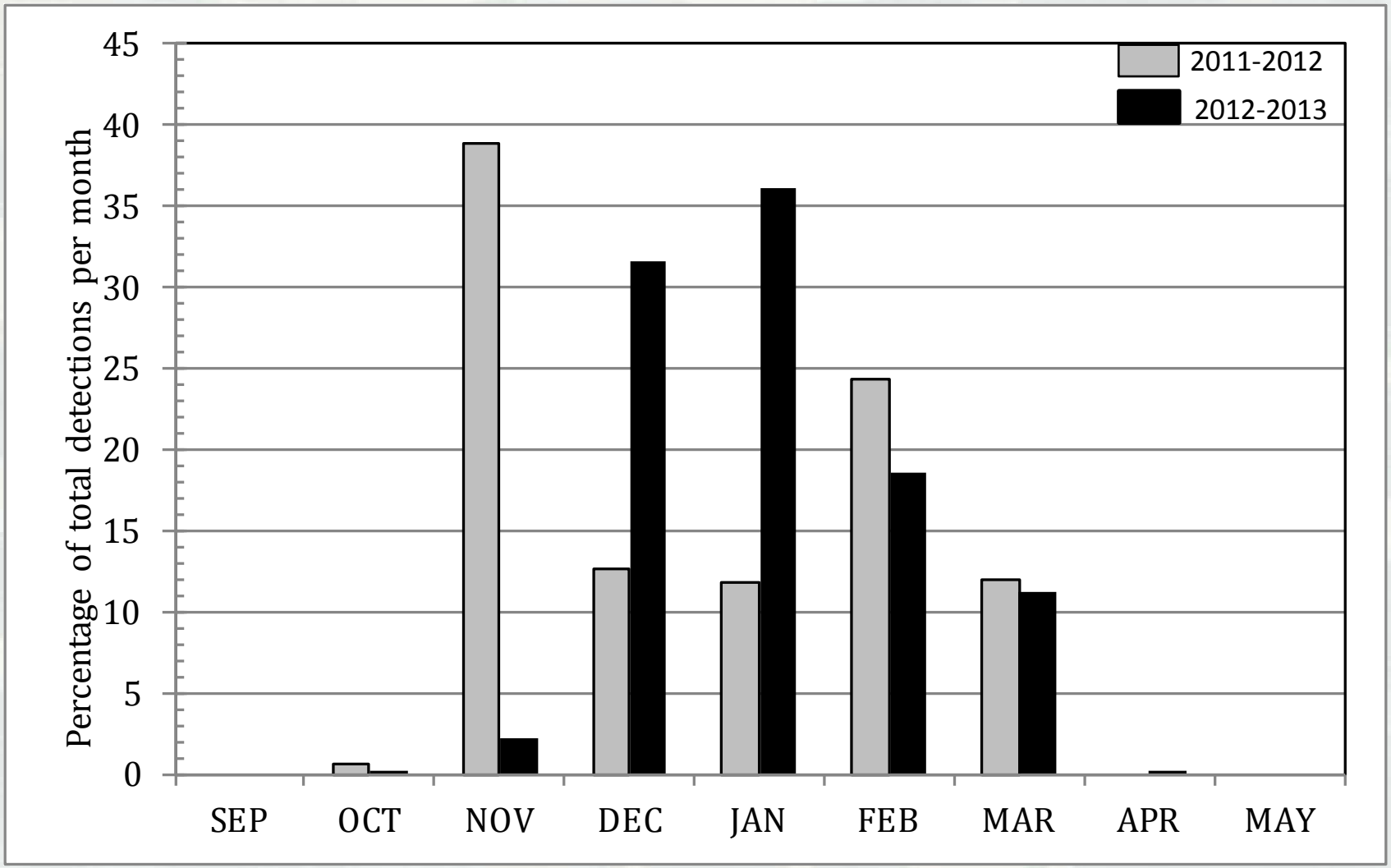
Total detections per receiver

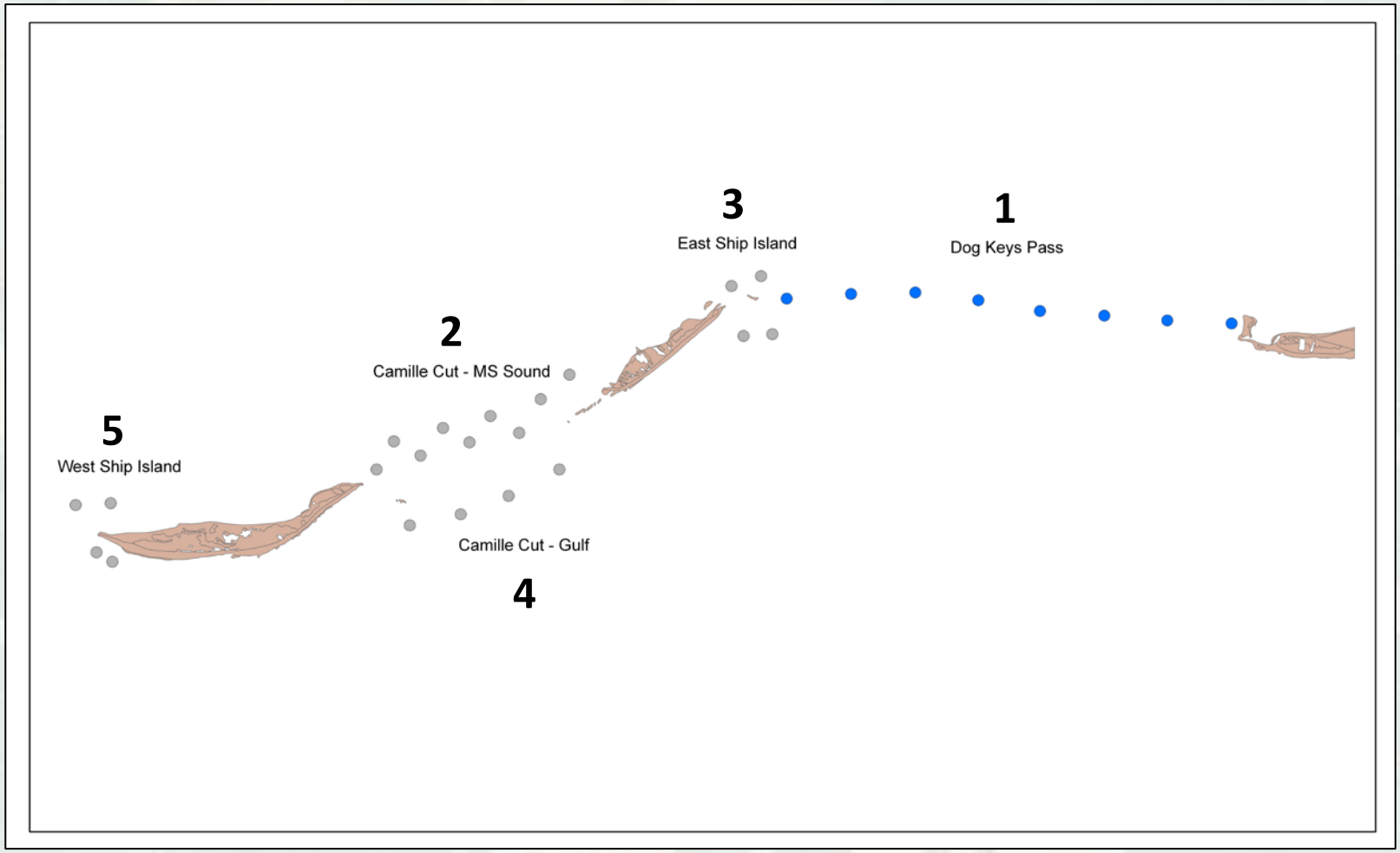


Distribution of total detections across all VR2Ws in the MsCIP array. The number within the plotted receiver represents the total number of Gulf sturgeon documented on that specific receiver during the deployment period. Color of receiver buffer depicts the relative number of detections recorded during the deployment period.


14
12
10
8
6
4
2
0
Number of sturgeon per month
2011-2012
2012-2013
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY

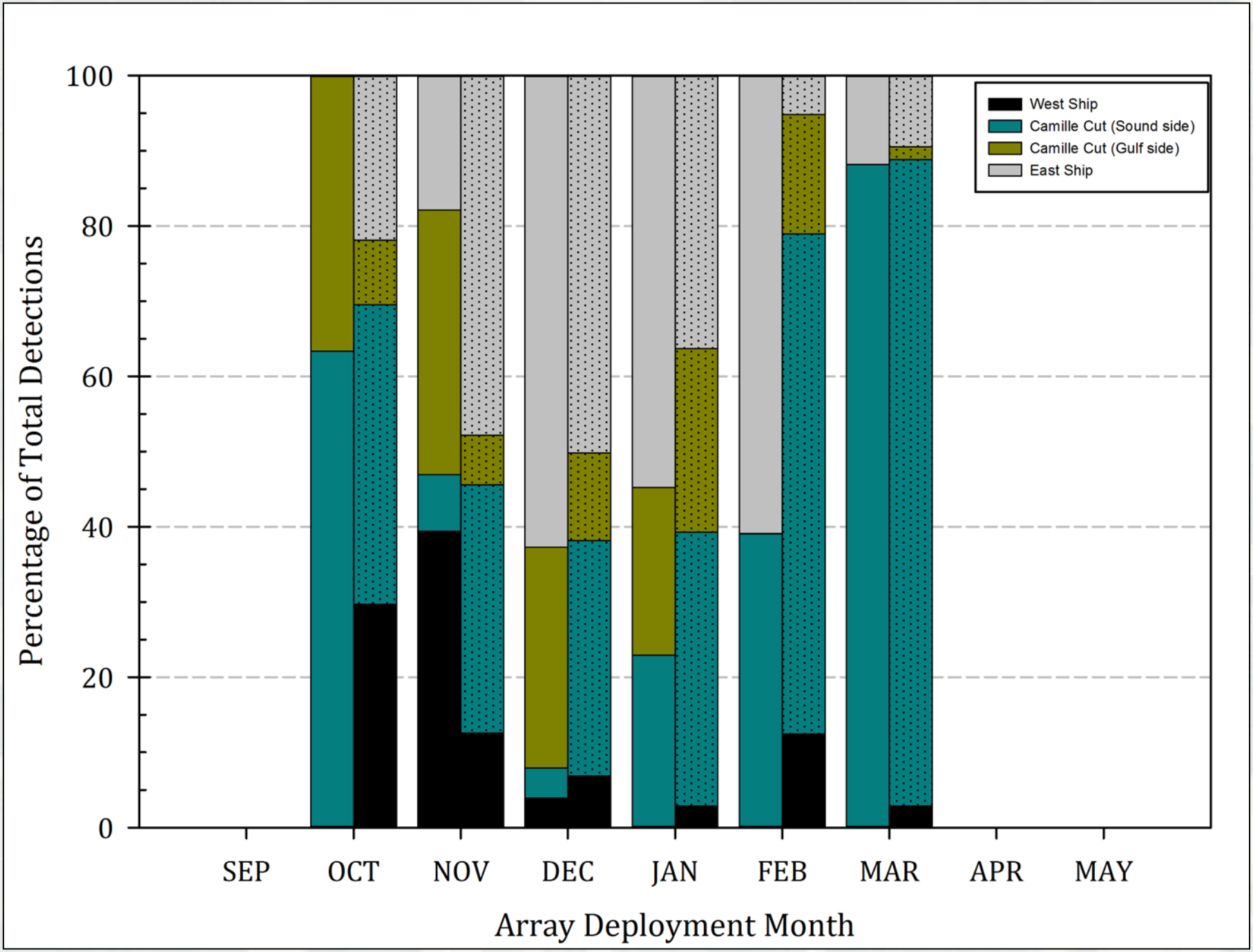

40000
35000
30000
25000
20000
15000
10000
5000
0
Number of detections per month
2011-2012
2012-2013
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY

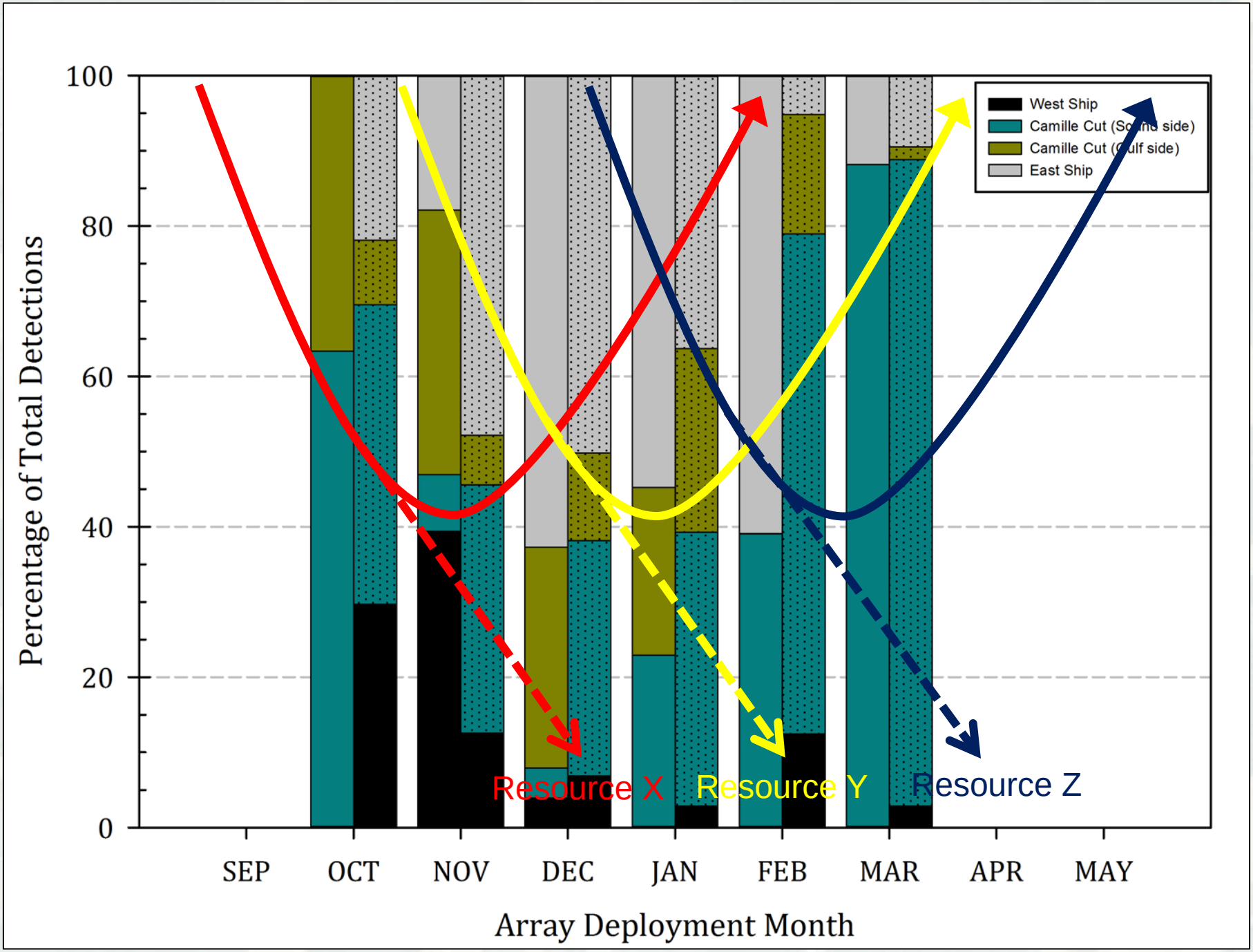

Percentage of total detections per month
45
40
35
30
25
20
15
10
5
0
2011-2012
2012-2013
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY



The mean number of detections per zone by month (2012-2013 deployment period):

- Dog Keys Pass (7,695; STD = 10,195)
- Camille Cut (Sound side) (2,104; STD = 2,650),
- East Ship (1,031; STD = 1,524)
- Camille Cut (Gulf side) (657; STD = 1,027)
- West Ship (293; STD = 461)

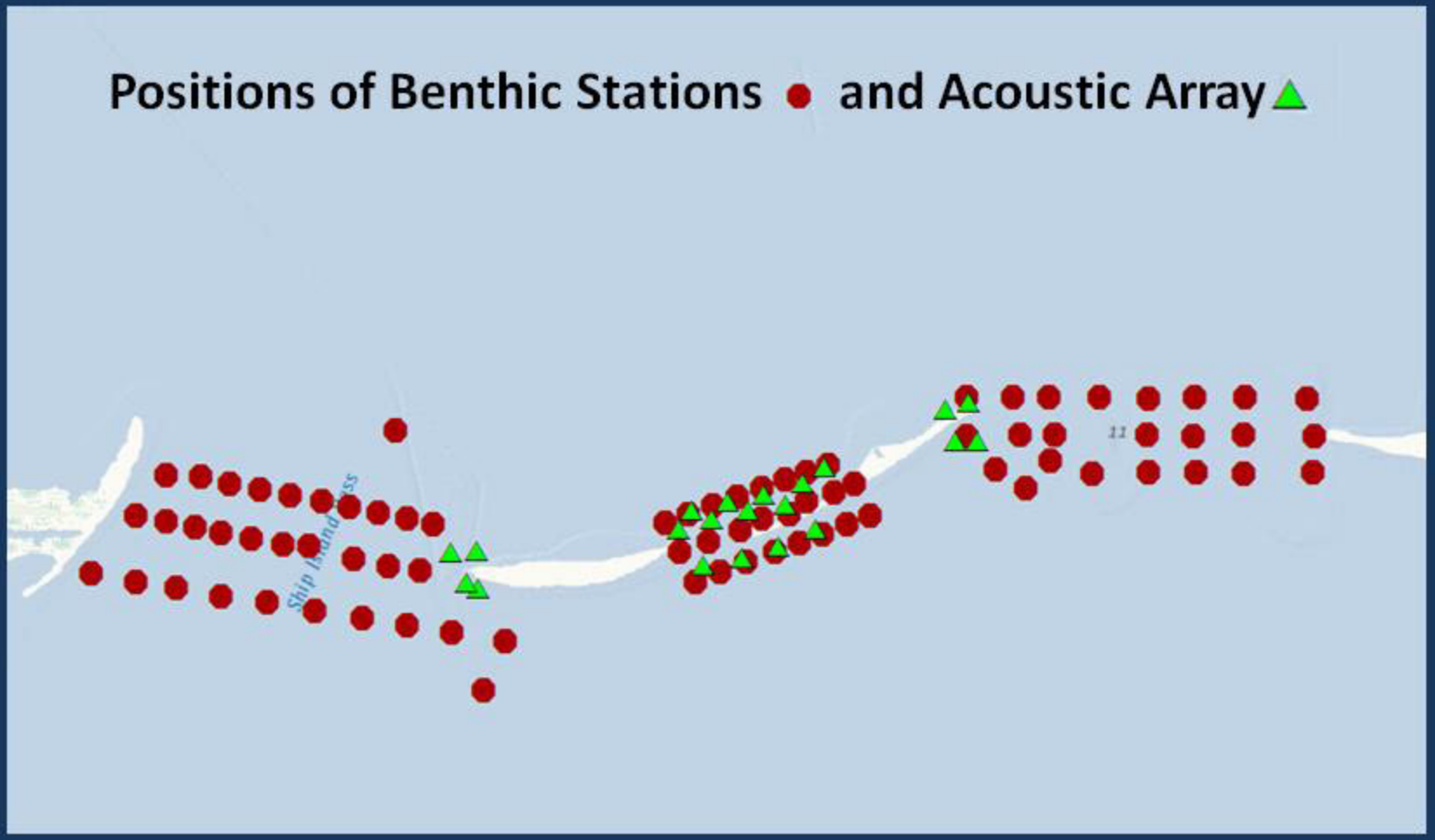

100
80
60
40
20
0
Percentage of Total Detections
West Ship
Camille Cut (Sound side)
Camille Cut (Gulf side)
East Ship
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
Array Deployment Month


Percentage of Total Detections
100
80
60
40
20
0
SEP
OCT
NOV
DEC
JAN
FEB
MAR
APR
MAY
Array Deployment Month
West Ship
Camille Cut (Sound side)
Camille Cut (Gulf side)
East Ship
Resource X
Resource Y
Resource Z

Detection summary
13 September 2012 – 11 June 2013

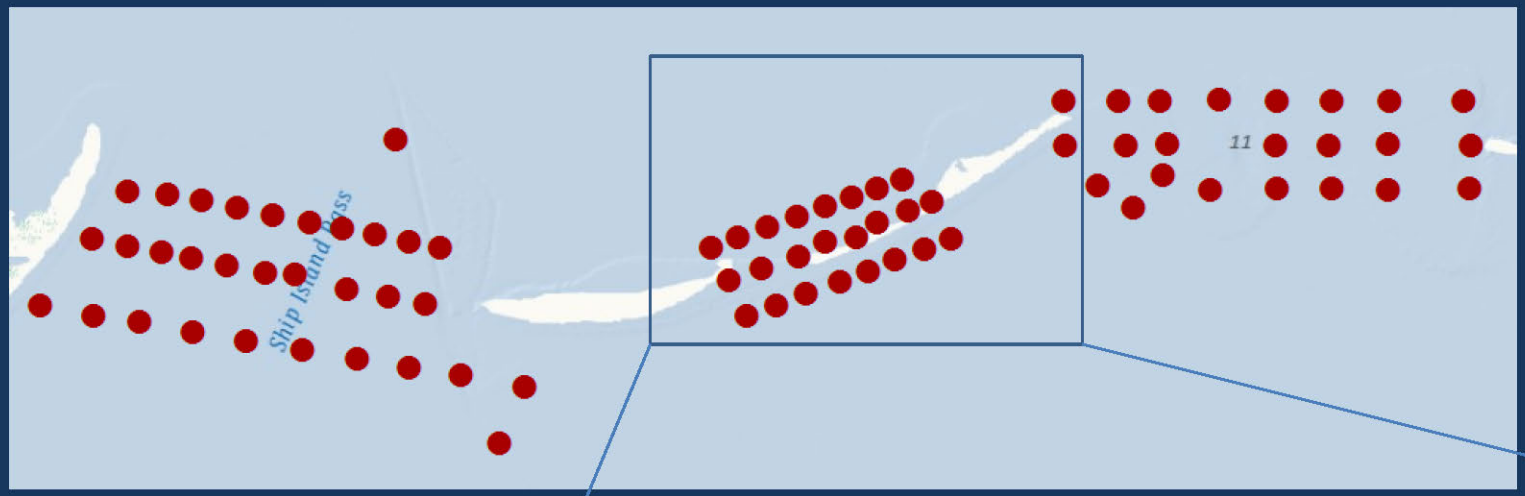
River of Origin	Transmitter	West Pass				Camille Cut													East Pass				Dog Keys Pass								Total Det	Number of stations Sturgeon present at
		WS1	WS2	WS3	WS4	CC5	CC6	CC7	CC8	CC9	CC10	CC11	CC12	CC13	CC14	CC15	CC16	CC17	ES18	ES19	ES20	ES21	DK1	DK3	DK5	DK7	DK9	DK11	DK13	DK15		
Pearl	A69-1303-45717	187	372	22	79	14	26	18	12	305	139	65	60	9	0	0	1	10	0	0	12	16	0	0	0	0	0	0	0	0	1347	17
Pearl	A69-1303-45767	0	0	0	0	0	0	0	113	0	0	0	0	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	206	2
Pearl	A69-1303-45720	29	34	0	6	9	13	0	0	29	23	25	0	0	12	5	3	0	51	165	17	21	23	78	20287	276	18	33	35	8	21200	23
Pearl	A69-1303-45746	165	174	347	28	170	556	245	74	752	2674	1636	750	31	1602	109	13	0	3	3	15	1	2	6	26	4	0	5	0	0	9391	25
Pearl	A69-1303-45765	1	6	7	0	0	0	0	0	0	0	0	0	0	8	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	24	6
Pearl	A69-1303-45721	11	6	25	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55	4
Pascagoula	A69-1303-46208	3	0	0	0	4	0	0	0	40	17	0	0	0	38	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	106	6
Pascagoula	A69-1303-45053	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	89	444	0	0	0	2	288	3	32	34	17	0	909	8
Pascagoula	A69-1303-46215	12	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	10	81	4
Pascagoula	A69-9001-29899	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	272	0	9	0	5	2891	51	21	26	56	8	3364	10
Escambia	A69-1303-61008	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	4	0	0	32	30	5	18	88	0	0	0	0	8	200	8
Yellow	A69-9001-30554	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	764	3675	598	1496	2137	4148	1469	1478	185	389	214	50	16603	12
Yellow	A69-9001-30564	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33	313	71	224	35	1010	1686	6
Brothers	A69-1303-46423	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	138	394	2394	349	3343	6622	6
Brothers	A69-1303-45716	73	109	81	0	0	0	8	22	0	0	0	18	0	18	4	20	0	0	0	0	0	0	0	0	0	0	0	0	0	353	9
Brothers	A69-1303-46434	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	561	71	2	635	4
Brothers	A69-9001-30534	12	4	11	0	0	0	0	0	0	0	0	0	0	5	3	26	27	0	353	11	18	24	18	6993	68	2	144	76	10	7805	18
Blackwater	A69-1303-61040	48	68	349	0	228	469	310	806	408	1742	875	2541	3	1959	195	343	73	0	0	49	9	69	19	575	583	19	303	448	186	12677	26
Blackwater	A69-1303-61034	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	701	701	1
Blackwater	A69-1303-61041	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0	0	5	0	0	0	0	0	0	0	0	0	31	761	6812	7633	5
Choctawhatchee	A69-1303-45862	6	6	9	4	118	93	59	8	268	688	214	47	6	437	102	184	2	6	58	1	7	2	1	1	82	3	173	61	0	2646	28
	Total Det @ Stat	547	817	851	130	543	1157	640	1035	1802	5283	2815	3416	142	4103	422	606	122	938	4970	735	1607	2262	4295	32655	2996	746	4317	2144	12148		
	Total GS @ Stat	11	10	8	5	6	5	5	6	6	6	5	5	5	9	7	9	7	6	7	8	9	7	9	11	10	10	12	12	12		

Detection history – movement patterns – periodicity – habitat association

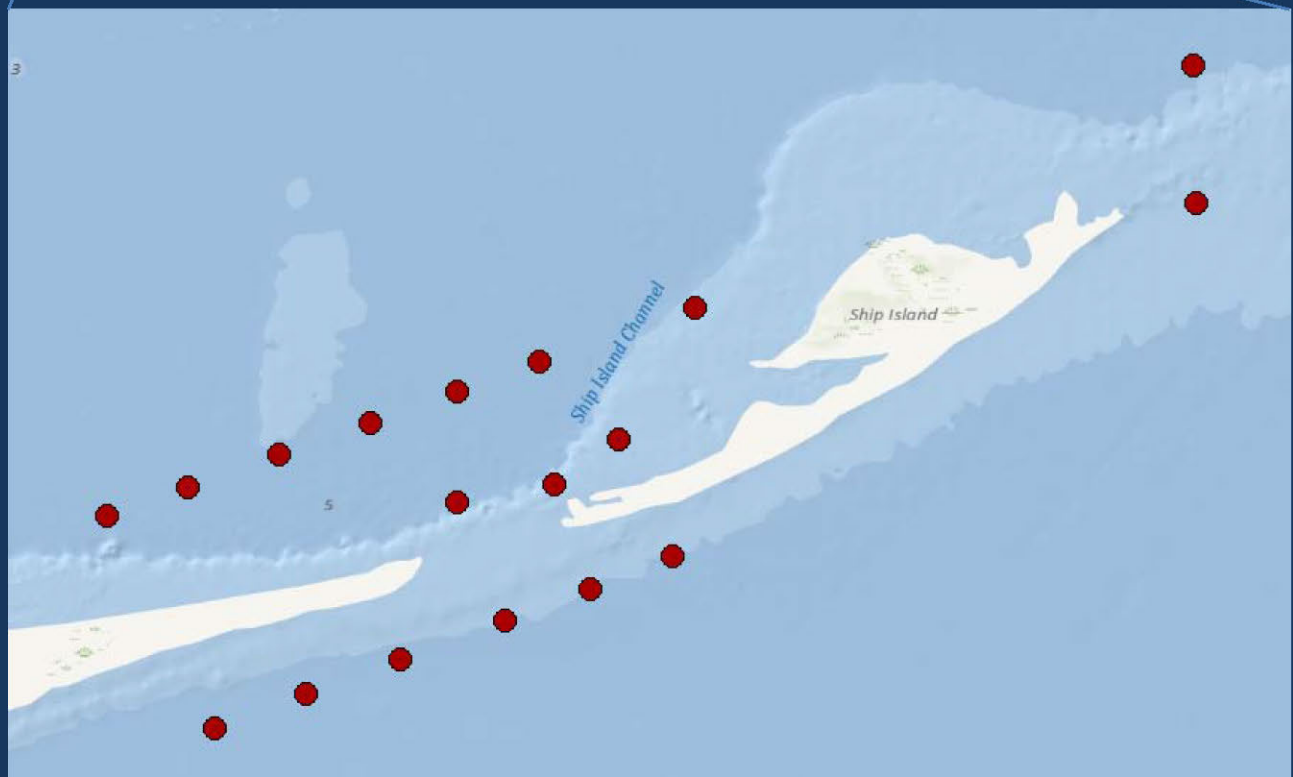


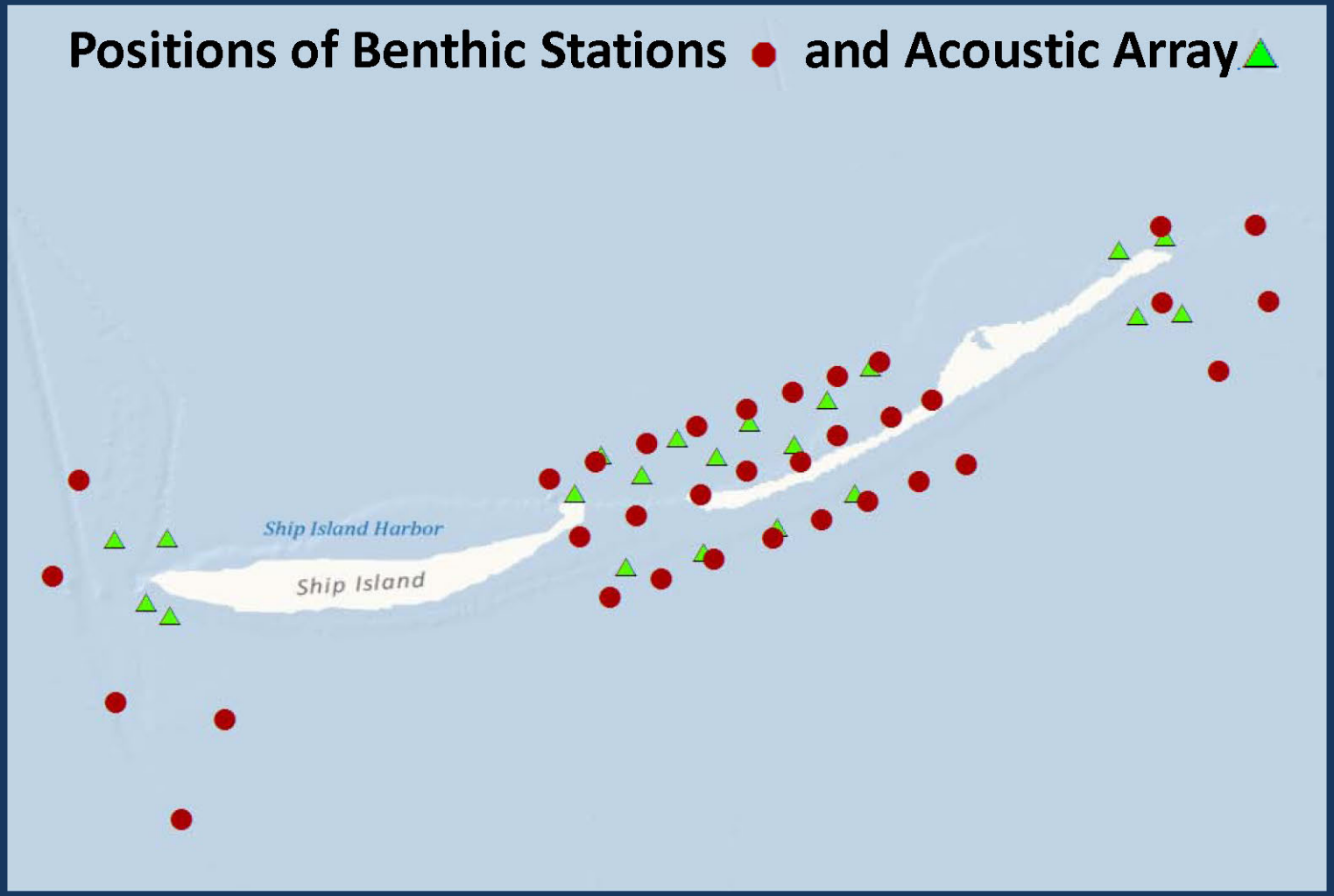
Benthos samples provided to MsCIP by Vittor and Associates.

Broad-Scale Habitat Assessment



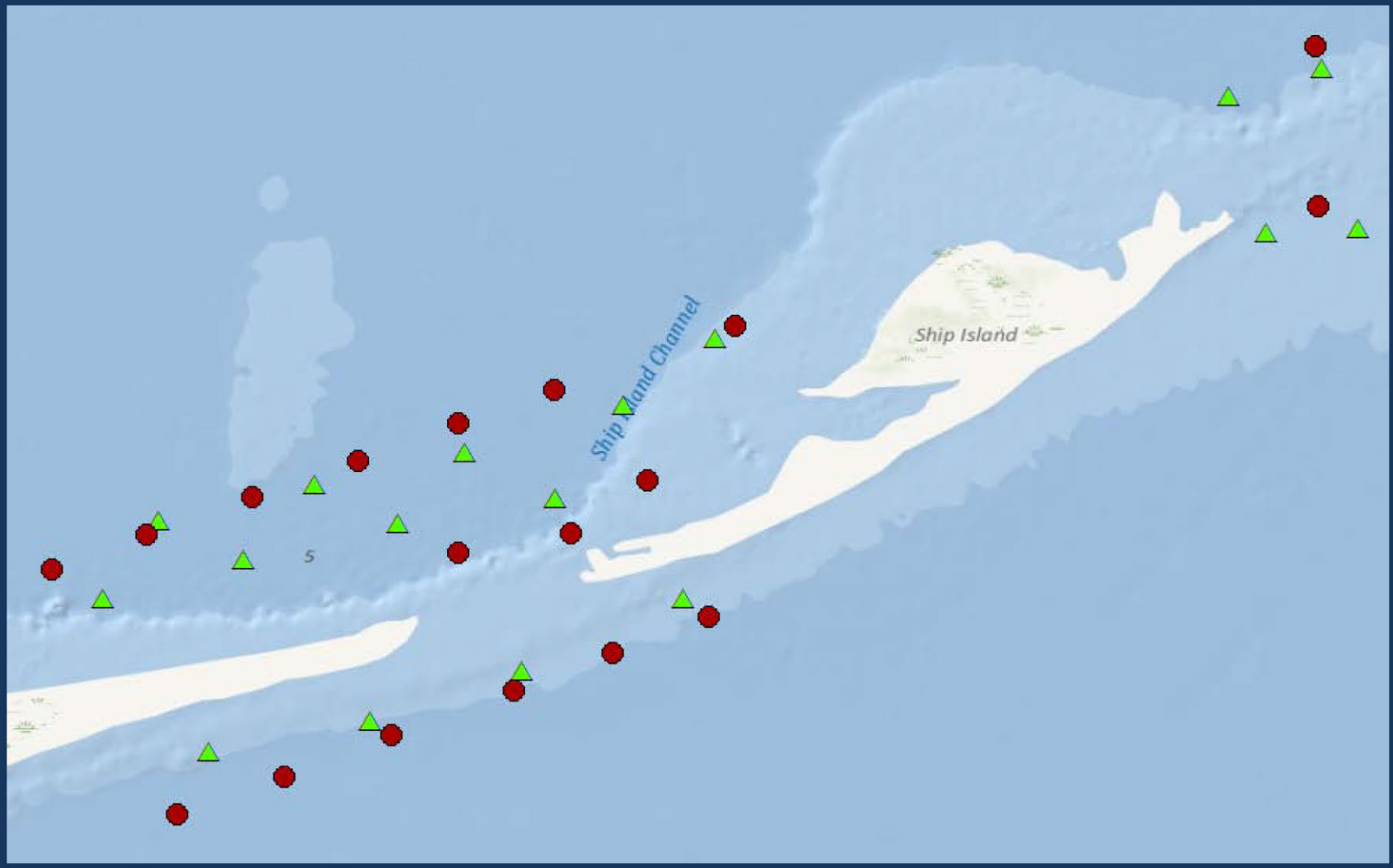
Fine-Scale Habitat Assessment



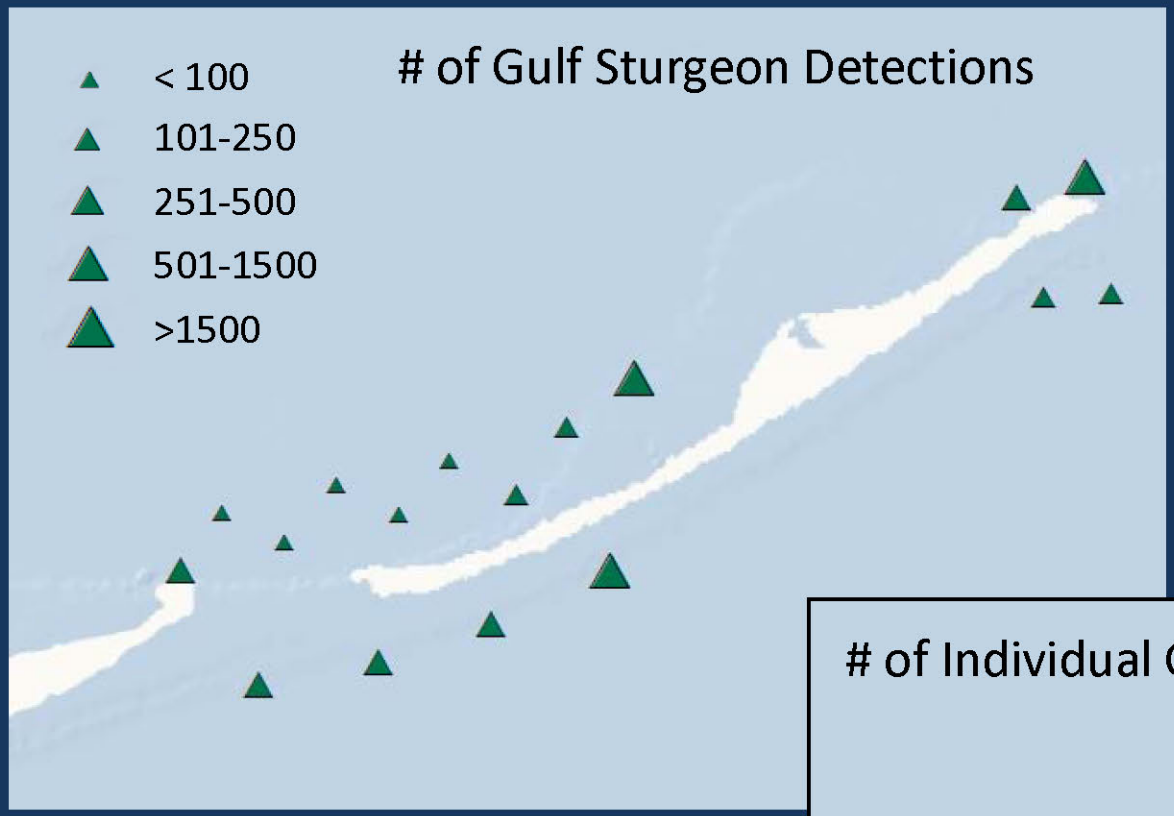


To examine associations between gulf sturgeon and benthic fauna, only those benthic stations within 500m of an acoustic receiver were included in fine-scale analyses.

Benthic ● and Acoustic ▲ Stations used in Fine-Scale Habitat Assessments



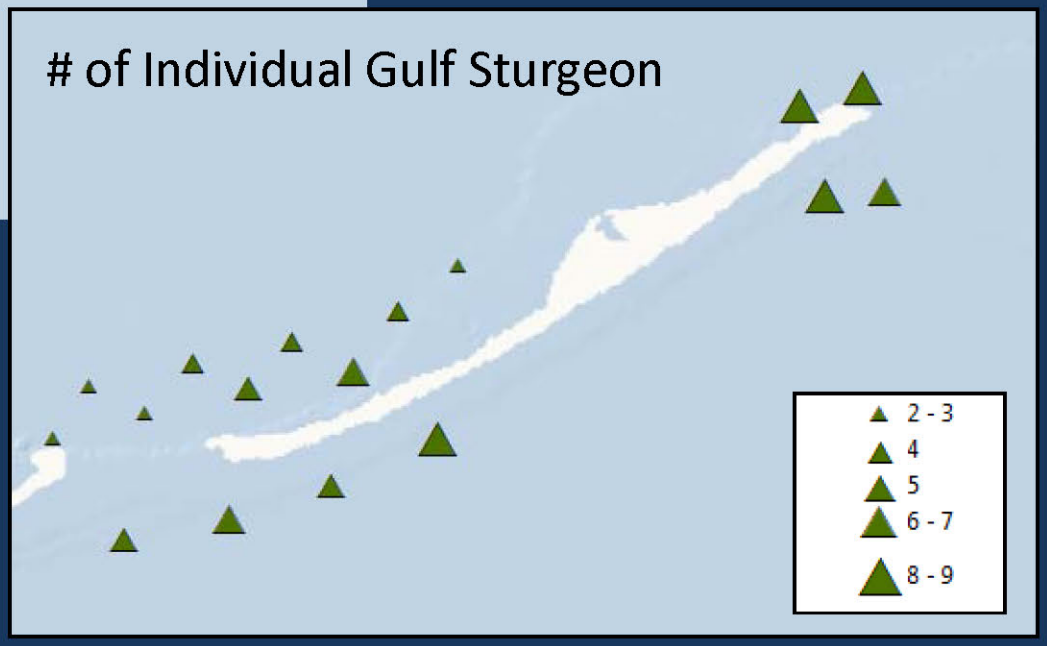
Fine-Scale Habitat Assessment



Classification of Sturgeon Habitat Use

Low < 500 hits and < five fish
High > 500 hits or ≥ five fish

2011-2012 deployment period



Fine-Scale Habitat Assessment

Benthic data were aggregated at the genus level, square-root transformed, and used to create a Bray-Curtis similarity matrix from which an MDS plot was created that depicted the benthic stations by low vs. high gulf sturgeon habitat use.

An ANOSIM test showed the benthic assemblages differed significantly between low vs. high stations.

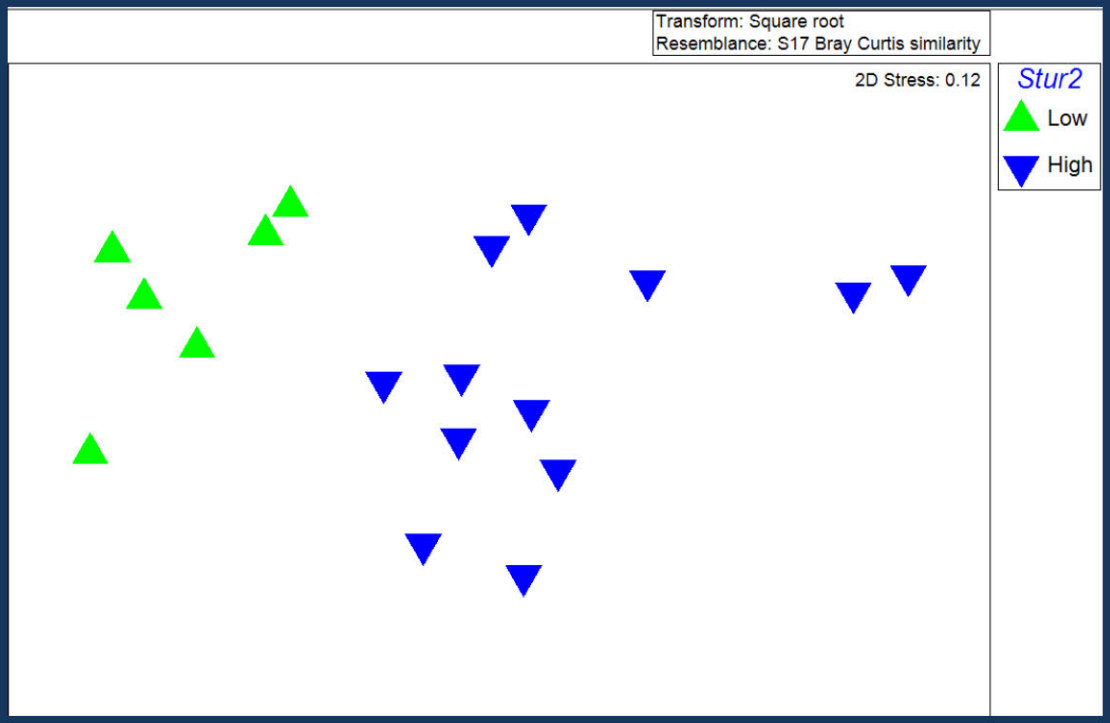
SIMPER analysis revealed the benthic taxa that contributed to the observed difference.

Fine-Scale Habitat Assessment

Relative Sturgeon Habitat Use

SIMPER results	Low	High
Taxon	Av.Abund	Av.Abund
Paraprionospio pinnata	2.57	0.08
Meredithia uebelackerae	2.99	0.69
Nemertea (LPIL)	0.17	1.40
Mediomastus (LPIL)	2.17	1.64
Tubulanus (LPIL)	1.97	0.70
Branchiostoma (LPIL)	0.00	1.35
Oxyurostylis spp.	0.58	1.31
Nassarius acutus	0.29	1.13
Tellina spp.	0.74	1.09
Tubificidae (LPIL)	0.17	1.02
Polygordius (LPIL)	0.00	0.94
Leitoscoloplos spp.	0.00	0.86
Acanthohaustorius spp.	0.17	0.66
Lineidae (LPIL)	0.86	0.53
Sigambra sp.	0.67	0.29
Paracaprella tenuis	0.76	0.14
Phascolion strombi	0.50	0.20
Apoprionospio pygmaea	0.00	0.70
Glycinde solitaria	0.62	0.17

MDS plot

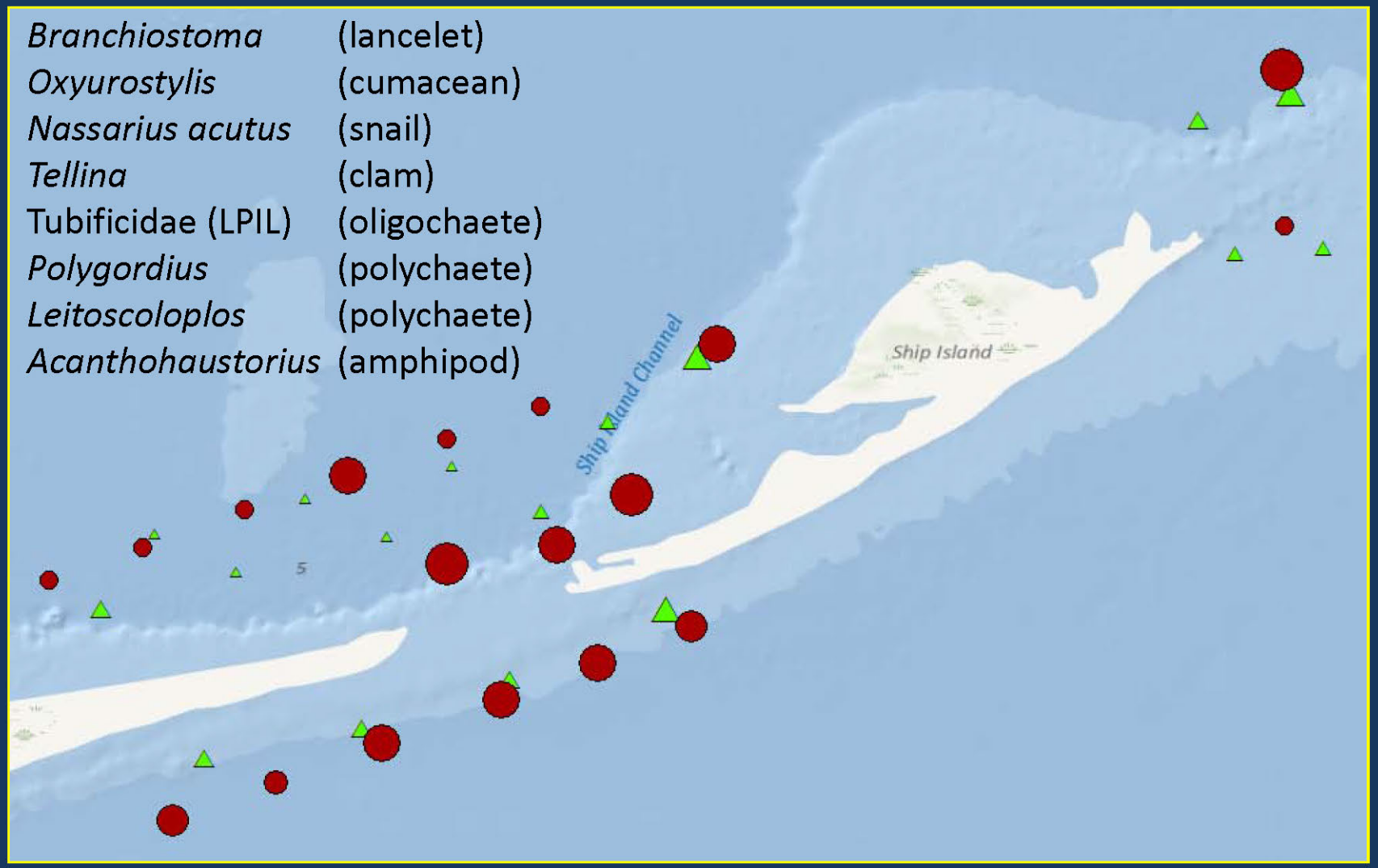


ANOSIM R = 0.63, p = 0.001

Highlighted taxa are known Gulf sturgeon prey items (Brooks and Sulak 2005, Ross et al. 2009)

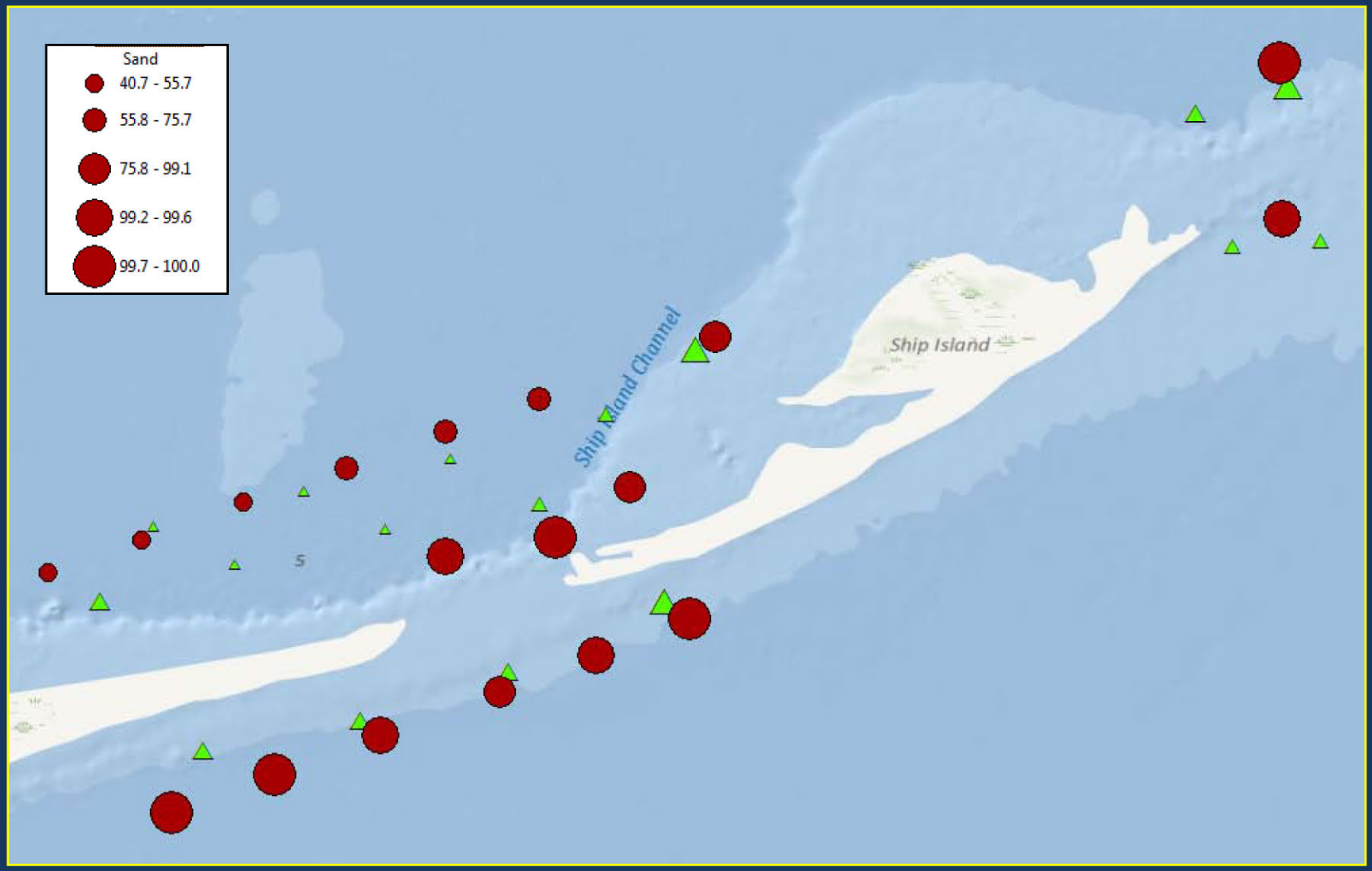
Fine-Scale Habitat Assessment

Relative combined abundances of eight prey taxa ● and relative number of gulf sturgeon detections ▲



Fine-Scale Habitat Assessment

% Sand

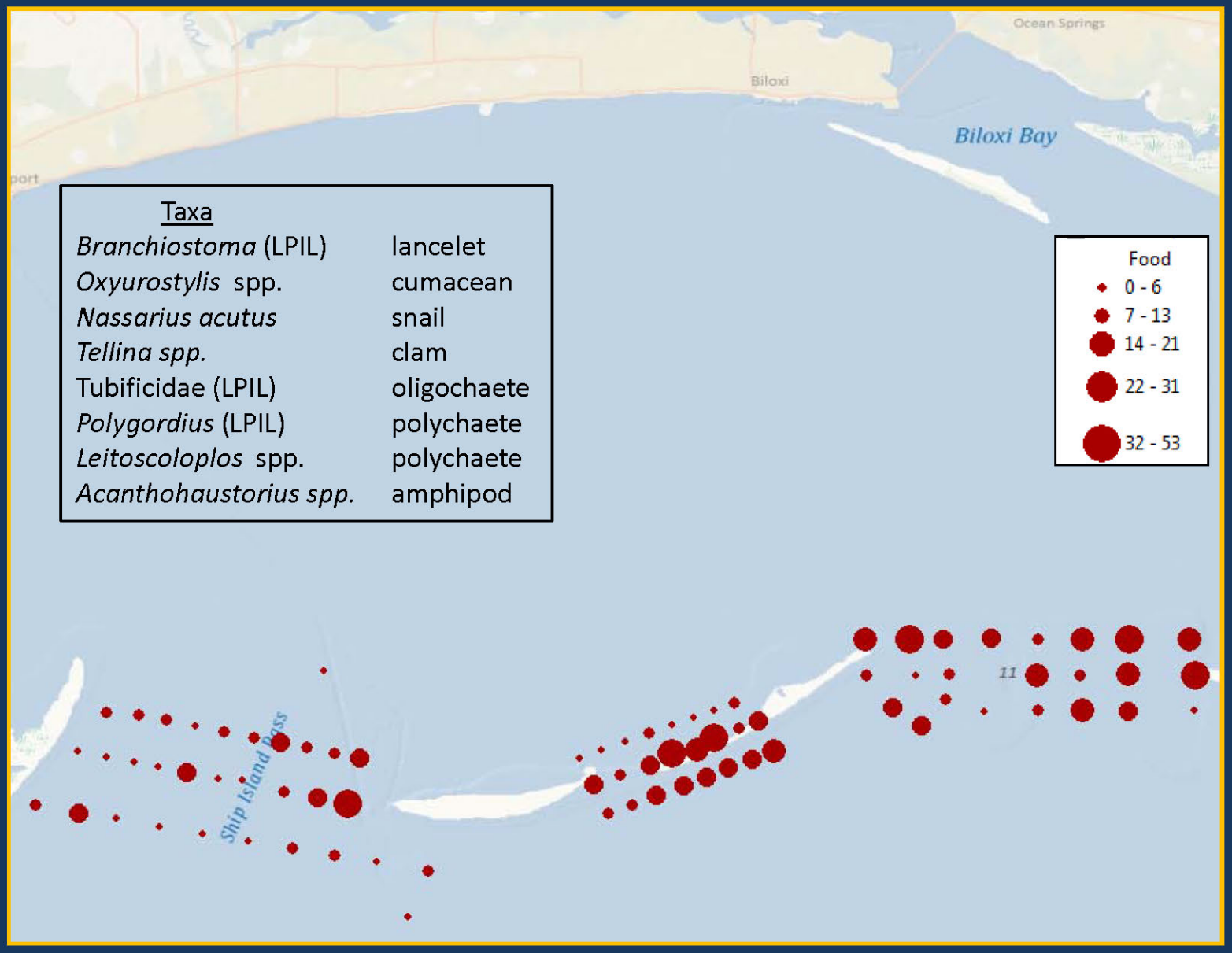


The fine-scale habitat assessment indicates that gulf sturgeon distributions correspond with sandy habitat where known prey (Brooks and Sulak, 2005; Ross et al. 2009) densities are higher.

The relative total abundances of the eight benthic prey taxa identified in the fine-scale assessment were mapped over the full array of benthic stations (Broad-Scale Habitat Assessment)

Broad-Scale Benthic Habitat Assessment

Gulf Sturgeon Prey Taxa Only



On the radar….

- Continue telemetry based assessment (pre-construction, construction, post-construction).

- Refine the benthos assessment applied to the 2011-2012 deployment period (e.g., reevaluate metrics for defining high/low categories).

- Refine and finalize description of “important” prey items (applicable to other regions – Pascagoula estuary).

- Apply new approach to current benthos dataset.

- More detailed evaluation of detection history of individual fish to identify movement patterns (i.e., corridors) in comparison to long-duration residency areas (i.e., feeding).

Credits

Paul Grammer
Jeanne-Marie Havrylkoff
Paul Mickle
Bradley Lewis
Steven George
Alan Katzenmeyer
Phil Kirk
Mike Lowe
Cher Newman
Emily Satterfield
Bradley Ennis

Sara Ashworth
Claire Matten
Erik Lang
Charles Thompson
Jack Killgore
Jay Collins
Cedric Doolittle
Rob Smith
Dara Wilber
Kevin Reine
Chuck Dickerson

Figure 1. Station locations for the Benthic Macroinfaunal Community Assessment, MsCIP, 2010 - 2011.

Benthic Sampling in Support of Gulf Sturgeon Habitat Characterization in the Vicinity of Ship Island, Mississippi

In 2010 and 2011, Barry A. Vittor & Associates conducted benthic sampling to identify benthic macroinfauna organisms in and around potential borrow and littoral zone areas associated with the U.S. Army Corps of Engineers' Mississippi Coastal Improvements Program (MsCIP) Barrier Island Restoration Project. In addition to this program, it was determined that additional benthic sampling to support the Gulf sturgeon monitoring studies being conducted under MsCIP as relating to barrier island restoration activities was an important component in the completion of the objectives of the overall benthic assessment as it pertains to the barrier island restoration effort. The Gulf sturgeon study is being conducted by Dr. William T. Slack of the U.S. Army Engineer Research and Development Center (ERDC) and Dr. Mark S. Peterson of the University of Southern Mississippi - Gulf Coast Research Laboratory. To the extent practicable, the additional samplings included sites in Mississippi Sound that were surveyed previously under the 2010 and 2011 efforts.

Objectives

The benthic sampling was performed in support of Gulf sturgeon habitat characterization in the vicinity of Ship Island, Mississippi which represents one component of a larger effort examining sturgeon occupation of nearshore waters, including tidal passes and specifically an overwash area of Ship Island, known as Camille Cut. The results of the sampling were coordinated with parallel efforts examining Gulf sturgeon movements within the study area. This effort is being conducted under the technical oversight of the Environmental Laboratory of ERDC.

Benthic Sample Locations

Benthic community sample transects were associated with the passes and shoals in open waters between Cat Island and West Ship Island, Camille Cut, and Dog Keys Pass as indicated as illustrated in Figure 1. Where practical, sample locations included sites in Mississippi Sound that have been surveyed previously in 2010 and 2011 in conjunction with the barrier island restoration benthic community studies (Figure 2). The sample locations included:

1) Three transects across the waters between Cat Island and West Ship Island, each with 10 sample points;

2) Two sample points in the Gulfport Ship Channel (1 station north of West Ship Island and 1 station south of the Island);

3) Three transects across Camille Cut, each with 8 sample points; and

4) Three transects across Dog Keys Pass, each with 8 sample points.

This sampling approach produced 80 points at which benthic macroinfauna and sediment texture samples were collected (Figure 3). The samplings were conducted in October, 2011.

Benthic Sample Collection Methods

Benthic macroinfaunal samples were taken at each station with a Shipek grab or a modified Van Veen grab with a sampling area of 0.04 m^2. Both grabs are spring-loaded and are designed for collecting consistent samples in sand and consolidated sediments. The samples were rinsed in the field through a 0.5-mm mesh screen and preserved with 10% buffered formalin. A subsample (approximately 250 gm) was collected from each grab for sediment texture analysis.

At each station, standard hydrographic measurements were taken at up to three depths depending on ambient water depths, which included near surface, middle, and near-bottom depths prior to benthic sampling. A YSI ® Model 600XL Datasonde or equivalent was used to measure temperature, conductivity, salinity, pH, and dissolved oxygen (DO) concentration.

Laboratory Analyses

Infauna: In the laboratory, benthic samples were inventoried, rinsed through a 0.5–mm mesh sieve to remove preservatives and sediment, stained with Rose Bengal, and stored in 70% isopropanol solution until processing. Sample material was sorted and all macroinvertebrates removed and placed in labeled glass vials containing 70% isopropanol, with each vial representing a major taxonomic group (*e.g.* Oligochaeta, Mollusca, Arthropoda). Oligochaetes were individually mounted and cleared on microscope slides prior to identification. All sorted macroinvertebrates were identified to the lowest practical identification level (LPIL) which in most cases was to species level unless the specimen was a juvenile, damaged, or otherwise unidentifiable. The number of individuals of each taxon, excluding fragments, was recorded.

Sediment Grain Size Analysis: One sample was collected at each station for sediment grain size analysis. Each sample was washed with deionized water, dried, and weighed. The coarse and fine fractions (sand/silt) were separated by sieving through a U.S. Standard Sieve Mesh #230 (62.5 μm). Median grain size and percentages of gravel, sand, silt, and clay were calculated for each sample.

Data Analyses

The following numerical indices were calculated for each sample:

1) Infaunal abundance (total number of individuals per station);

2) Infaunal density (total number of individuals per square meter);

3) Species richness (total number of taxa represented in a given station and by Margalef's D);

4) Taxa diversity (Pielou's Index H`); and

5) Evenness (Pielou's Index J`).

Data Utilization

A field survey report was prepared which detailed sample/data collection efforts, problems encountered, and observations of sea state/weather.

Data for macroinfauna sample analysis was prepared and provided in an EXCEL spreadsheet electronic format to the Environmental Laboratory of ERDC. Standard community statistics were presented in tabular form and included taxa abundance, individual abundance and density, various diversity and evenness indices, and species richness. A phylogenetic listing of all taxa censused was also provided. In addition, sediment texture data was provided in hard copy.

All data reports were provided to ERDC upon completion of field sampling efforts. Environmental Laboratory of ERDC utilization of this data will characterize Gulf sturgeon use of habitat in those previously identified sampled areas. In addition, this data will provide a baseline for future Gulf sturgeon habitat utilization comparison.

Figure 1 - Benthic community sample transects

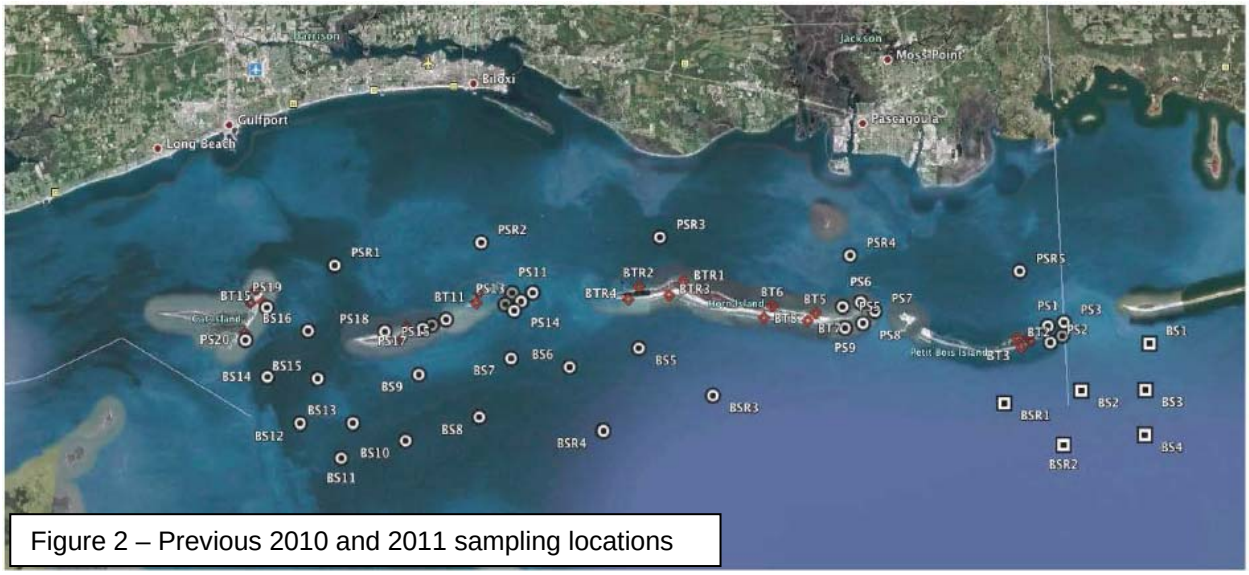


Figure 2 – Previous 2010 and 2011 sampling locations

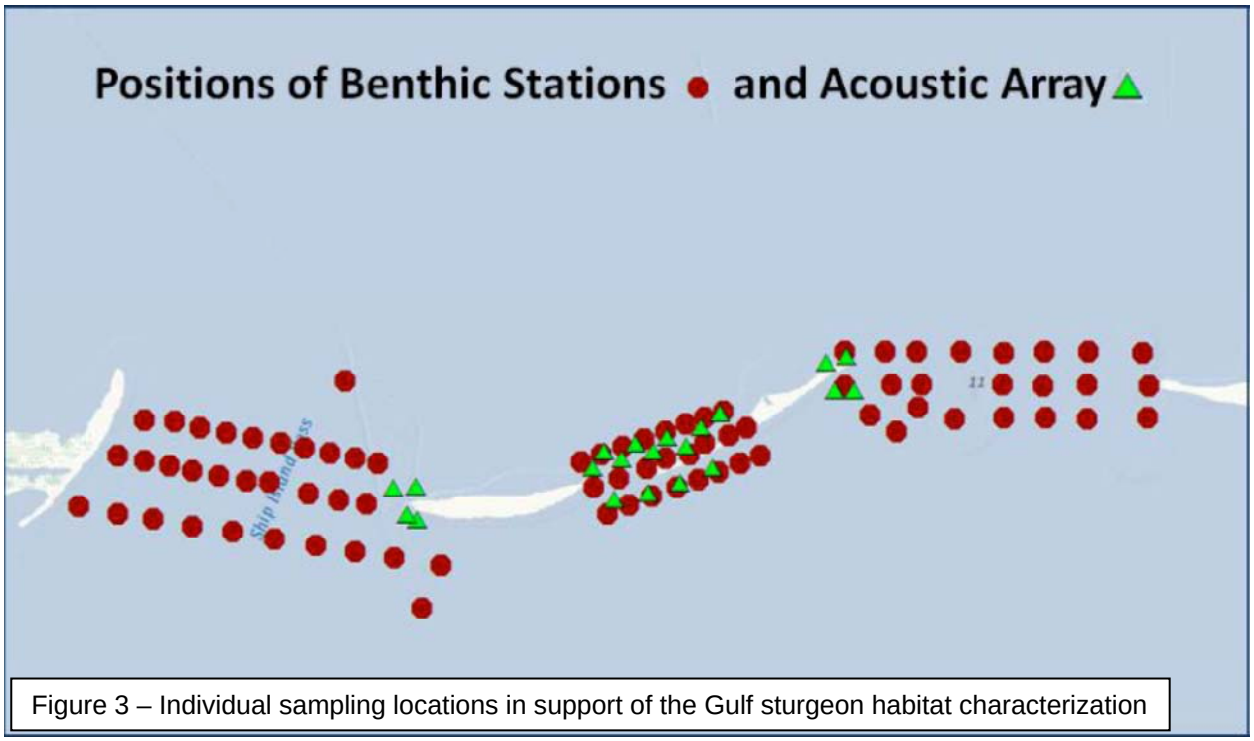


Figure 3 – Individual sampling locations in support of the Gulf sturgeon habitat characterization